# CIVIL ENGINEERING IN THE FIRST CENTURY OF THE OHIO STATE UNIVERSITY

When The Ohio State University began its work of instruction in the fall of 1873, one of the seven professors on duty was responsible for Mathematics and Civil Engineering. The purpose of that course was:

> To enable our pupils to survey their own lands, lay out roads, take levels for ditches, embankments, and under-drains, construct bridges, etc., and in short to fit them for the several avocations in life for which a knowledge acquired in this department is indispensable.

That first year was a sort of shake-down. Near its close, in meeting the 29th of May, 1874, the faculty decided:

> That the Institution confer the degrees of Bachelor of Arts, Bachelor of Science, and Civil Engineer upon those who have gone through the required courses of study....

Civil Engineering, therefore, ranks as the first of the "special" or professional courses offered by the University.

For the celebration of the first fifty years of The Ohio State University, in 1920, Thomas Corwin Mendenhall, one of the original seven faculty members, described the other six. Civil Engineering was represented by Robert W. McFarland, who, judging by the pictures of the seven, was the handsomest of the lot. According to Mendenhall:

> Almost as much in evidence on the Campus as the clock-tower of University Hall was our Mathematician and Civil Engineer, Professor Robert W. McFarland; for, besides having his residence on a spot not far from the Long Walk, he was charged with the care, development, and protection of the College grounds, and no one who ever knew him would doubt that he was most assiduous and untiring in the discharge of his duties... At fifty years of age, McFarland was an interesting and striking figure. Tall, erect,

> with the stride and bearing of a soldier, walking hatless, as was his usual custom, from his residence to the College building, head heavily covered with iron gray hair and beard to match, the ever-present book in hand from which he read as he walked, he presented a picture not easily effaced from the memory of his colleagues or the students of his day....

Besides mathematics and civil engineering, Professor McFarland taught astronomy, and for several years, until an officer of the United States Army was assigned to the University, he handled military tactics or "drill". He had been a teacher, as well as a student, from the time he was fourteen years old; he had received both bachelor's and master's degrees from Ohio Wesleyan University; he had advanced from captain to lieutenant colonel in the Civil War; he had been professor of mathematics and astronomy at Miami University; and he had applied his mathematics and astronomy to the practice of surveying and other civil engineering specialties.

McFarland occupied his "chair" during the first twelve years of operation of Ohio State, and performed a variety of engineering and other duties that were thrust upon him. Beginning in 1876, the lieutenant assigned to handle military tactics relieved McFarland of some of the load in mathematics. In 1883 another assistant in the mathematics teaching was provided by the appointment of Christopher Newton Brown, a student under McFarland 1876-79, who had left without taking a degree and had gained engineering experience, particularly in railroad location.

At Commencement time in 1881 certificates of proficiency in civil engineering were awarded to three persons. It was not until 1883, however, that the University graduated its first Civil Engineer. The probable reason that

there were no Civil Engineer graduates earlier is that others had followed Brown's example and had left school to take jobs as soon as they felt they had learned enough to go to work.

Dr. McFarland (Ohio Wesleyan made him a LL. D. in 1882) left Ohio State in 1885 to become president of Miami University. His colleagues on the faculty expressed regret at his decision to "return to his old field of labor and to assume control of the Miami University," and

> Resolved: That while we should be happy to have him remain longer in this portion of the educational vineyard, we wish him Godspeed in his departure from us and hope for him and the Miami University that portion of success which his zeal and energy are sure to merit.

According to Mendenhall, McFarland soon left the Miami presidency for engineering practice:

> At the end of three years he resigned to assume the management of a large holding in real estate by the Sunday Creek Coal Company in the Hocking Valley. Here he found ample opportunity for utilizing his knowledge of civil engineering, and for a dozen years he discharged the duties of this office so satisfactorily as to receive high praise from the officers of the company... His death at the age of eighty-five years occurred on October 23, 1910.

For the last seven years of his life, Dr. McFarland was again associated with The Ohio State University as Emeritus Professor of Civil Engineering.

At the June, 1885, meeting of the Board of Trustees of The Ohio State University, according to the annual report for 1885:

> Mr. C. Newton Brown, for the last two years an assistant to Professor McFarland, was elected assistant professor and placed in charge of the Department of Civil Engineering.

That was when Civil Engineering became a separate department, for Pro-

fessor George Comstock had been elected professor of Mathematics.

Christopher Newton Brown remained the Head of Civil Engineering at Ohio State the rest of his life, and his service included being the second Dean of the College of Engineering. He died suddenly in March, 1902. His career was summarized in the address delivered the 24th of June, 1908, by Dean F. A. Ray of the College of Engineering at the unveiling of a tablet in Brown Hall:*

> In Grateful Remembrance of CHRISTOPHER NEWTON BROWN, Dean of the College of Engineering, and for twenty years Professor of Civil Engineering, who by his arduous and successful labors for the advancement of his institution, his pupils, and his community, won the love and admiration of all who knew him, this building has been named BROWN HALL on the recommendation of his colleagues and by the action of the Board of Trustees. Erected A.D. 1903.

Dean Ray told of Brown's being initiated into civil engineering by his father, who was County Surveyor of Lawrence County and City Engineer of Ironton, Ohio, and because of his apparent ability:

> His father decided to give him the advantage of better training and in 1876 young Brown was sent to The Ohio State University, where he made an honorable record as a faithful, energetic, and capable student, beloved by his fellows and respected by his instructors. Brown completed the technical work of his course, but left the University before completing the requirements for a degree.**
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> In 1883 Professor R. W. McFarland, then Professor of Mathematics and Civil Engineering, induced the trustees to call Brown to the University as Assistant in Civil Engineering. His rise in the University was steady. He became in succession, Assistant, Assistant

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*The Department of Civil Engineering moved to Brown Hall at the opening of the fall term 1903, from Hayes Hall. It had been in Hayes Hall since moving from the Main Building (University Hall) as authorized by the Board of Trustees meeting of December 16, 1896 which appropriated not to exceed $800 for the move.

**In 1886 Miami University, of which Dr. McFarland was president, gave Brown the degree of Civil Engineer.

> Professor, Associate Professor, and Professor. In 1901 his colleagues made him the Dean of the College of Engineering, the duties of which position he was discharging with ability and success at the time of his death, March 6th, 1902, at the age of forty-four years, --just in the prime of his life and usefulness, and in the twentieth year of his University service.
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> Professor Brown was large, handsome, and dignified.
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> .....
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> As Edward Orton, Jr., has well said: "Professor Brown's public services had grown side by side with his advancement in University work. He first became an assistant in the Ohio Geological Survey in 1882, and in 1892 he occupied the position of chief of field work. His reports are models of conciseness and accuracy...In 1901 the Governor of Ohio appointed him as his representative in supervising the topographical survey, made by the State and the U. S. Geological Survey working in cooperation. His fine acquirements and early experience enabled him to yield a service to the people of his State which no other man in Ohio could have done."...

Dean Ray's address is printed in A Commemorative Bulletin, published in 1910 by the Department of Civil Engineering. This Bulletin summarizes the history of the Department of Civil Engineering during the first quarter century of its independence apart from the Department of Mathematics. The writer of the Bulletin was Christopher Elias Sherman who succeeded Brown as Chairman of the Department of Civil Engineering and remained in that position for thirty-six years. Sherman also succeeded Brown as representative of the Governor of Ohio in the work of the Ohio Co-operative Topographic Survey. Sherman's four-volume report on that co-operative project is a work of major technical and historical importance.

Sherman's last book, Land of Kingdom Come, a volume of reminiscences, appeared in 1936 and was sent to friends and former students as a Christmas

present. It contains, besides his philosophy and bonhommie (including some verse) considerable information on the history of the Department of Civil Engineering.*

Discussing "What is best in an engineering education," Sherman told of his aversion to school and how his ideas changed as he became acquainted with the profession of civil engineering:

> Upon graduating from high school my ambition was to follow some calling which required no further schooling. I was tired of books and wanted no more book-learning. I entered a county surveyor's office, beginning as a "peg-whacker," was promoted to flagman, then chainman, then level-rodman; became curious about the instruments and learned to run the level and transit. All this, including ordinary drafting, I did well at the end of the first year, and it would have cinched my education and self-satisfaction, if we had not added a college graduate to the corps in the spring--the only college man in the office.
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> I could beat him running the instruments--for example, could set up the transit over a tack, with zeros together, in a minute while it took him nearly five--could beat him at drafting, and also at arithmetic, for, having had some trigonometry in high school, I had practiced on latitude and departure during the winter... But he raised disquieting questions. Talked about methods and subjects I had never heard of and said, "high school wasn't a patch on college." Curiosity is one prime mover; I decided to go to college. But only for a year or two, just to get the meat out of the course, and no more. Give me no French, English, chemistry, or such-like "frills"--so they made out a class-card marked "Special" with freshman mathematics, sophomore surveying, drafting, physics, and geology.
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> I nearly failed out of college the first term because of the "non-practical" subjects and "non-practical" parts of the practical subjects... I conditioned the first term, merited the second (because needed to remove the condition) and failed the third term entirely--lost interest

*Some of Sherman's philosophy appears in "Mechanics with Vision," his Commencement Convocation address in March, 1929: "Yes, the spirit, the vision's the thing, because it lights up the labor. And the labor's the thing, for it strengthens the vision..." This address is printed in Land of Kingdom Come.

> in the "non-practical stuff" and wanted to be off on surveys down South...At Chattanooga, fortunately, during the year following, I met able men--members of the American Society, who, not by precept but by example, aroused my ambition. So I came back to finish, and although illness kept me out another year--spent mostly in railroad work in the West and in geological work in Ohio--had the satisfaction of getting a sheepskin.

Sherman got his sheepskin with the class of 1894, and had the satisfaction of being able to publish his thesis, The Theory and Practice of Lettering, and have it turn out rather well as a textbook, issued through six editions.

After graduation with the degree of Civil Engineer, Sherman worked August to October, 1894, making a survey and report on the oil lands of Washington County, Ohio. Then, to November 1894, he was topographer on the Columbus, Hocking Valley & Athens R.R. survey. Following that, until February 1896, he was Chief Draftsman on national barge canal surveys in Ohio. Through the summer of 1896 he worked on the Ohio State campus, drafting a relief map of Ohio and being construction engineer for the University.

Then he began teaching. He was assistant in Civil Engineering at Ohio State 1896-1897; assistant professor of Civil Engineering 1897-1901; associate professor of Civil Engineering 1901-1902. In 1902, following the death of Dean Brown, Sherman became Professor of Civil Engineering and Chairman of the Department. In 1938 he stepped down as Chairman but continued to teach until he became Professor Emeritus in the fall of 1939. He died the 6th of May, 1940.

"Chris" Sherman, as he was known to many college generations of students of Civil Engineering at The Ohio State University (and to many other students and friends and associates) was a notable figure. He wore a goatee and often dressed

rather formally, with a stand-up collar and bow tie. With William D. Turnbull, a Civil Engineering graduate, class of 1908 and professor of Engineering Drawing, Sherman participated in many humorous debates, to the delight of students at the annual Engineers' Round-up. He might take the affirmative side of such a question as "Resolved, the professors should serve refreshments in the classroom," only to be accused by Turnbull of having already done so (a student was overheard to say that Sherman "handed out a lot of applesauce and baloney") and wanting the University to shoulder the expense.

The Transit Club, organization of students of Civil Engineering, was formed in 1907. In 1911 it joined similar clubs at the University of Illinois and Purdue to become the Ohio State Chapter of Triangle Fraternity.

Summer camp for students in Civil Engineering, as well as prescribed shop courses for students in other curricula of the College of Engineering, appears to have got started by the initiative of Professor Brown. According to the minutes of the College of Engineering Faculty meeting of March 1, 1898:

> The professor of Civil Engineering laid before the Faculty a scheme for the extending of the practical field work for the course in civil engineering by means of a summer school.

A committee was appointed, and at a special meeting the 10th of March, the Faculty resolved to add this requirement if the Board of Trustees would provide for the additional expense. Accordingly, the summer camp courses were established, C.E. 22 for sophomores and C.E. 23 following the junior year. Professor Sherman's Commemorative Bulletin describes in detail the summer camps in 1900 through 1910 under the heading "Practical Work". His description begins

with this philosophy:

> ...Few engineers out of school find time for so long a drill in principles as is given in a college course. Why put practicums in the course if the student is sure to get these outside? Because it is almost idle to send forth graduates who cannot handle the instruments of their profession with a reasonable degree of skill. Not very long ago practicing engineers were prejudiced against college graduates, because of their clumsy fingers. The prejudice has not all vanished yet, because of their clumsy arithmetic. The early college graduate, if he got a job at all, filled a minor position on the corps, frequently under a practical party chief with not a high school diploma.
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> To remedy this situation, in 1900 a summer course in field work was established, consisting of four weeks of practical surveying at the close of the second and third years each. This summer work does not replace the exercises still given on the campus...But from such exercise the student can get no adequate idea of field and office procedure, nor acquire reasonable skill in manipulation. So in 1900 the department purchased a complete camp outfit, --tents, cots, cooking utensils and other camp furniture, --and took the students into the rough southeastern portion of the state.

That 1900 camp, near Nelsonville, was the first of a long series of experiences lasting nearly sixty years. Professor Sherman commented in nearly every annual report on the importance of this method of getting practical experience, although students who managed to obtain engineering jobs were given equivalent credit. The most romantic of the summer camps was that of 1905, when 26 sophomores and six juniors, together with four faculty members, made road and topographic surveys in Yellowstone Park. As described in the Commemorative Bulletin:

> ...The object of the survey was to furnish accurate maps of the well-known stage routes, showing the natural wonders of interest to the tourist and the details of construction for purposes of administration. Needless to say, the work proved most engaging.

> During four weeks of active surveying some 42 miles were mapped. Doubtless a greater variety of natural topographic features are to be found in the Park than in any equal area in the world. A special code of symbols... was necessary to represent them all...
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> The field maps were drawn to two hundred feet per inch in rolls of several miles per sheet. The finished maps were traced from these on 18 x 30 inch sheets, water features blue, cultural features black, relief in brown, and survey lines and marks in red. These finished maps were traced during the Christmas vacation following, by the students most proficient in topographic drawing....

Beginning in 1902, many of the camps--a majority, in fact--were for the purpose of doing practical work under contract, mostly for public purposes for which funds were not available, so that, as Professor Sherman pointed out, there was no question about unfair competition with practicing surveyors. Some camps were missed because no University funds were available. A number of summers, the reports state, there was "No Summer Camp--all got jobs." The 1903 camp work consisted of surveys of several thousand acres of coal land in southeastern Kentucky. Some experiences of that summer are related in Professor Sherman's Land of Kingdom Come, for according to the Commemorative Bulletin, "the camp was pitched on the north fork of the Kentucky River, two miles below the mouth of Kingdom Come Creek, some miles from 'Hell for Sartin.'"

Land surveys, surveying for railroads (electric railways in the teens), and for streets, sewers, and highways, as well as topography and hydro-electric projects, are reported as conducted in the summer camp programs. For about a quarter century, beginning in the late teens, much of the work was on highway surveys. Many of those projects were under the direction of the late Professor R. C. Sloane who arranged contracts with the Ohio Department of Highways for this introduction to professional practice.

Following the Second World War, the summer camp routine was resumed with Professor Sloane again in charge of arrangements. After his death, in the fall of 1946, however, the plan of the camp was changed to a policy of requiring all students in Civil Engineering to attend the Summer Surveying Camp at the end of the sophomore year. At the camp, during a nine-week period, three courses, each three-weeks in length, were given, viz.:

C.E. 501-A, Topographic Mapping

C.E. 501-B, Route Surveying

C.E. 501-C, Precise Surveying

Beginning with the 1948 season, the Summer Camp was located at Camp C. E. Sherman, at Zaleski, Ohio, in barracks left following operation of the Civilian Conservation Corps of the 1930's. The three-weeks courses were rotated, so that every student (unless already credited with the work) would take each of them. Operations of the 1948 and 1949 camps, under the direction of Professor G. H. Harding, attracted considerable attention, and proposals were made that other departments of the University giving instruction in surveying (Agricultural Engineering, for example) might be interested in the camp, making surveying on the campus unnecessary. The 1949 camp was visited by officers of the U. S. Army and Navy. As a result of this outside interest, the Summer Camp of 1950 and again of 1951, directed by Professor E. H. Karrer, included students from a number of engineering colleges who were enrolled in the Naval Reserve Officers Training Corps.

This method of obtaining practical surveying experience, though different

in concept from Professor Sherman's idea that every student should be encouraged to get an acceptable surveying job on his own, if possible, was found to be highly successful.

Nevertheless, the camp program was discontinued in 1957. The scope of civil engineering and the sophistication of its techniques were increasing rapidly. New concepts deserved a place in the curriculum, and throughout the country the amount of required surveying credit was being reduced in favor of a broader educational experience. Furthermore, the cost of the program was objectionable and many students felt that they could acquire comparable experience in remunerative summer jobs with, for example, the Ohio Department of Highways."

By listing all members of the faculty of Civil Engineering, both "past" and "present" (those who were teaching in the department in 1910) and all of the graduates, as well as all "ex-students," defined as those who had taken two or more of the courses required for the C.E. degree, Professor Sherman undertook to make A Commemorative Bulletin a means of unifying the persons who had some acquaintance with the department. His wish was expressed in the last sentence of the introduction to the section on Ex-students: "It is hoped that a copy of this booklet may reach each one in the list who is now living, with best wishes of the department for his success."

This spirit of good will toward those who had been initiated into even a few of the practices of civil engineering at The Ohio State University was typical of Professor Sherman. Near the close of his service, in the 1929 annual report, he stated that he was personally acquainted with all but a few of the 700 living

graduates of the department. A photograph for the class picture was almost a requirement for graduation. Sherman prided himself on being able to call nearly all graduates, as well as many ex-students, by name if they happened to call on him. The class pictures were hung in the halls of Brown Hall, and Sherman would frequently stop to study them.

Besides presenting the educational attainments and experience of the faculty members in the Commemorative Bulletin, Sherman made a point of describing the public services of students and instructors. The work of students in the summer camps was detailed as a public service, since it was mostly surveying for state agencies which otherwise would not have been able to have it done. In addition, Sherman and other instructors frequently employed students as assistants and draftsmen on various public projects. For example, in 1909 highway maps of the 88 Ohio counties were prepared and published by the State Highway Department, and Sherman wrote:

> This work was all done at the University by students and graduates (chiefly undergraduates) doing the bulk of the work during the summer vacation, under the writer's direction.

Maps prepared under Sherman's direction included a base map of the State of Ohio, showing county boundaries, county seats, and other towns, and special maps--railway, streams, original land subdivisions, etc. -generally superimposed on the base map. In his accompanying text for the map of the original Ohio land subdivisions Sherman used the striking expression, "A map is a condensed history"*

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*Much of the excellence of Sherman's maps was due to the superior skill of the chief draftsman, William D. Turnbull, E. C. Ohio State 1908, a member of the staff of the Department of Engineering Drawing. In 1928 Turnbull became Junior Dean of the College of Engineering, and during 1936-37 was Acting Dean of the College.

Two deceased faculty members were particularly ~~commemorated~~ mentioned in A Commemorative Bulletin. One was Dean Brown. The other was Albert Henry Heller, C.E. from Ohio State in 1890, who, after experience in design with various bridge companies came to the University in April 1902, as Professor of Structural Engineering. Heller's book, Stresses in Structures, was a successful text. Professor Heller died in February, 1906, and his place was taken by Clyde Tucker Morris, later to become Chairman of the Department of Civil Engineering.

When Sherman became assistant in Civil Engineering in 1896, he succeeded Edward A. Kemmler, C.E. 1888, who, after three years of practical experience had returned to the department in 1891 as assistant. Kemmler advanced to assistant professor, and was an early proponent of photography as a useful tool in surveying. He resigned in 1896 to become Assistant City Engineer of Columbus.

Members of the faculty in 1910, when A Commemorative Bulletin was published, were, besides Sherman and Morris:

Frank Harvey Eno, Professor of Municipal Engineering, an 1891 graduate of the University of Illinois, with experience as engineer and superintendent at the World's Columbian Exposition, experience in design and construction of water supply plants and sewerage systems, who had become Associate Professor of Civil Engineering in April, 1902, Professor in 1906. Professor Eno became interested in research on highway subsoils, and, beginning in 1924, directed a co-operative project in that field for the U.S. Bureau of Public Roads and the Ohio Department of Highways. He was research professor from 1926 until his retirement in 1935. While he was research professor his service included being Chairman of the Highway Research Board.

Roy Karl Schlafly, C.E. Ohio State 1903. After experience in railway, water supply, and sewerage construction, he became Assistant Professor of Civil Engineering in the Department in September, 1905 remaining through 1913-14.

John Ross Chamberlin, who was a student at Ohio State 1899-1902, but had left school without taking his C.E. degree to work on railway location and construction in Peru, and then had had railroad experience in the United States. In January, 1905, Mr. Chamberlin had come to the department as assis tant in Civil Engineering, and, beginning in 1908, had been assistant professor. After leaving the department, Chamberlin became Chief Engineer of Bridges of the Ohio State Highway Department. Ohio State awarded him the C.E. degree in 1920 as of the class of 1902.

Kenneth Baker Ward, C.E. Ohio State Class of 1905. Mr. Ward had had considerable experience on railroad surveys and construction. He became assistant in Civil Engineering in June, 1905, taught to 1912.

Albert Harrison Hinkle, C. E. Ohio State 1907. After experience as Deputy County Surveyor and Engineer, Mr. Hinkle had come to the department as assistant in 1909. Later, he was Chief of Maintenance in the Ohio Department of Highways and completed his career in the Indiana Highway Department.

Among the past instructors listed in A Commemorative Bulletin, three subsequently had notable engineering careers:

Henry Diedrich Bruning, C.E. Ohio State 1896, served in the department as instructor January, 1903 to June 1905. He then became a railway contractor and consulting engineer and later was Division Engineer in the Ohio Department of Highways.

Clifford Shoemaker, C.E. as of the class of 1908 at Ohio State, after experience in the Philippine Islands. He was assistant in the department 1907-1909, and then became an engineer in the Ohio Department of Highways, serving as Chief of Construction.

Cyrus Alan Melick, C.E. Ohio State, 1903, was assistant in the Department of Civil Engineering during much of 1904, but left to work for a consulting engineer. He became Professor of Civil Engineering at Highland Park College, Des Moines, but returned to Ohio State in 1909 as Robinson Fellow and received the Doctor of Civil Engineering degree in June, 1911.

During the 36 years that Sherman was Chairman of the Department of Civil Engineering instructors and assistants came and went, of course, but there was

remarkable stability in the department staff. The work developed in great measure in the way it had started.

In 1925 the required course in astronomy was dropped, and instruction in geodesy was substituted in the department. The professor of geodesy who was responsible for the new courses (precise surveying and adjustment of observations) was a C.E. graduate from Ohio State University, Class of 1896, whose graduate education and teaching experience were somewhat unusual. He was Edwin F. Coddington and he had served as professor of Mathematics and professor of Mechanics, and for five years, 1915-1920, he had been Acting Dean of the College of Engineering.

Working his way through college, Coddington had been "janitor" during his senior year at the Emerson McMillin Observatory, assisting in setting up and adjusting the telescope and other equipment. At Commencement, 1896, the McMillin fellowship in astronomy was announced, and, without consulting Coddington, the Professor of Astronomy had reported that the first McMillin Fellow would be E. F. Coddington. Accordingly, Coddington received the M.Sc. in astronomy in 1897. Then after work at the Lick Observatory of the University of California, he had taken a Ph. D. in astronomy at the University of Berlin in 1902, and had begun teaching at Ohio State in 1902.

Highway engineering has long been one of the principal occupations of many graduates of the Department of Civil Engineering. (Railway engineering probably had preeminence until about the time of the first World War.) Beginning in 1927, the department offered a grouping of courses known as the highway option, under the general direction of Professor R. C. Sloane. Since Professor Sloane's death

in 1946, the highway courses have been directed by Professor E. H. Karrer. The first of the annual short courses in highway engineering was held February 24-March 8, 1913, in cooperation with the State Highway Department. It was financed by the Ohio Good Roads Federation.

Effective the first of July, 1938, the title of C. E. Sherman was changed from Professor and Chairman of the Department of Civil Engineering to Professor of Civil Engineering. Sherman's last annual report appears in the 1938 report of The Ohio State University as indicative of the way an engineering faculty may advance the public weal as well as performing instructional duties:

Department of Civil Engineering
C. E. Sherman, Chairman

> The progress of any department may be gauged by one or more of several standards--such as the success of the graduates, the adaptability of the curriculum to patent advances in the given science or art, the alertness of the instructional staff to advances occurring outside of the academic locale, and other criteria. One way in which a department may keep "up to concert pitch" is by the interest of the staff in the larger affairs of their profession, as for example, by research work in the practical field of production whereby both industry and the University may benefit from such practical contacts; broadening contacts may also result from more or less pure research. Such activities always with the proviso that they must not interfere with teaching duties stimulate the staff and thus improve the quality of information received by the students.
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> While the types of activities mentioned below for this group are by no means exceptional in this college, the department of Civil Engineering has been selected as indicating the way a faculty may contribute to the general progress of the commonwealth.
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> During the past three years the activities of the instructional staff of the department (aside from the main job of teaching and other regular college duties) have been as follows, beginning with the youngest ranking teacher:

1. O. J. Marshall helped organize geodetic surveys for the city of Cleveland and for the Bellevue Conservancy District in north central Ohio. In June 1936 he completed a critical examination of the Geodetic Control Survey for Columbus, Ohio, presented it in manuscript form, and received his professional degree of Civil Engineer from the University of Toronto, from which University he graduated in 1926.

2. G. E. Large directed tests bearing on the design of steel windbents for tall buildings. These tests were made on a large-scale model furnished by the American Institute of Steel Construction, and the results were published in 1936 in collaboration with S. T. Carpenter and C. T. Morris as Bulletin #66 of the Engineering Experiment Station. Professor Large also acted as consultant on the Cincinnati Suspension Bridge, and in awarding honorary scholarships at Swarthmore in 1936 and 1937.

3. C. H. Wall has perfected a solar device for getting azimuth from the sun with an ordinary transit, which expedites field procedure and promotes accuracy in surveying practice.

4. J. M. Montz assisted in securing the very successful practical results of summer surveying camps in 1936 and 1937 as mentioned below. He gave the highly appreciated address before the Ohio Retail Lumber Dealers Association on the subject of Wood as an Engineering Material.

5. R. C. Sloane has, with the assistance of Professors Montz and Wall, completed surveys (during the summers of 1936 and 1937) for the Research Station of the U. S. Soil Conservation Service north of Coshocton, Ohio. The Federal official in immediate charge wrote President Rightmire in regard to the work of instructors and students, "...we feel we can not speak too highly for them. We are greatly indebted to the University for this work." This sentiment was seconded by the Washington official in general charge, who requested a second summer of work, which also afforded good results to the government and practical experience to the students who each received compensation - $65 for six weeks.

6. J. C. Prior completed the design, and as consultant, directed the construction of the handsome bridge across the Scioto River at Main Street in Columbus, Ohio. As a result of research previously published, he is chairman of the Sub-Committee in charge of standardizing specifications for cast-iron pipe for the American Standards Association. He was also appointed by Governor Davey a member of the committee to investigate State Highway road contracts.

7. J. R. Shank in 1935 published Engineering Experiment Station Bulletin No. 90 on the Plastic Flow of Concrete summarizing his studies and experiments over a period of ten years.

8. E. F. Coddington assisted in organizing a geodetic survey for the Muskingum Conservancy District and has been collecting material for a publication of the more recent and accurate horizontal and vertical survey control points in Ohio.

9. C. T. Morris was appointed member and elected Chairman of a committee of six prominent engineers to investigate State Highway Contracts in Ohio. He is joint author of Engineering Experiment Station Bulletin No. 9 published in 1935 and of Bulletin No. 93 published in 1936.

10. C. E. Sherman in December 1936 published a volume of 150 pages of text and illustrations which was sent as a farewell communication to one throusand graduates of the department. In the summer of 1937 he was appointed a member and elected President of the Board of Directors of the Scioto-Sandusky Conservancy District.

Analogous activities by the other departments of this college would indicate the influence of our faculty on contemporary affairs.

One of the methods of teaching the profession of Civil Engineer which is believed to be unique, is practiced by this department for Summer School credit. Students are put on practical jobs such as surveys of public lands, etc., confining the activities to projects which would not otherwise be accomplished. Thus the student is given eminently practical training, at the same time avoiding competition with private surveyors. Another recent innovation concerns the teaching of the course in reinforced concrete structures. Part of the lecture course has been replaced by design work in the drafting room; the requirements in lectures and concrete laboratory have not been disturbed.

Ohio was the first large state in which the topographic survey work in co-operation with the United States Geological Survey was completed. About the beginning of the twenties the last of the 204 U.S.G.S. contour maps required to cover the State on the scale of 1:62,500 were published. Sherman's Vol. II of the Final Report describes the work and lists all the benchmarks in Ohio. (Vol. I reporting on the 1915 re-survey of the Ohio-Michigan Boundary was published in

1917.) *Cooperation with the U. S. Geological Survey continued in gaging the flow of Ohio streams and Sherman continued to represent the Governor of Ohio in this work. He published two Engineering Experiment Station bulletins on Ohio stream-flow and related problems. Perhaps because of his early work on the Ohio canal surveys he was an active proponent of a waterway between Lake Erie and the Ohio River.

Sherman was able to continue teaching his favorite subjects, particularly transportation engineering, in which he initiated his students into some of the mysteries of finance, for only a short time. In 1939 he became Professor Emeritus, and he died in May, 1940. This tribute appears in the faculty memorial:

> In the remembrance of his students, Professor Sherman's generous influence and genial personality live on. His productive contributions to engineering science and public service, his historical and literary proficiency, the friendly warmth of his companionship, the charm of his wit, and the sureness of his wisdom--all these his faculty colleagues and the members of this University recall and hold precious...

Clyde Tucker Morris, who succeeded Sherman in 1938 as Chairman of the Department of Civil Engineering, was a distinguished engineer. His professional specialty was structural engineering. He had developed his specialty following his graduation from Ohio State in 1898 by work with several bridge companies. He became associate professor in 1906, taking the place of the lately deceased Professor A. H. Heller, and professor in 1908.

On the occasion in 1957 of his receiving a citation for distinguished service

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*Vol. III of Sherman's Final Report of the Ohio Topographic Survey gives the story of the original land subdivisions in the State. Vol. IV contains information on the boundaries of Ohio, a history of the Topographic Survey, and other matters.

by the Ohio Society of Professional Engineers, of which he was a past president, Morris told how he happened to specialize in structural engineering. He began with telling how he happened to study civil engineering at all.

When he entered The Ohio State University in 1894 his intention was to fit himself for work as a mechanic or craftsman. He was taking the shops courses, and also engineering drawing. The instructor in drawing was Thomas E. French. When Morris told French his purpose in being in college, French advised: "Why don't you take civil engineering? Then you may be able to take up outside work or inside work, whichever you prefer."

Morris enrolled in the civil engineering course, and during his senior year, 1897-98, he was Emerson McMillin fellow in Astronomy. After receiving his C.E. degree in 1898 he was about (reluctantly) to take a position in the office of a county surveyor. One evening Professor Brown called at his home, saying that a bridge company had an opening, and perhaps Morris would like to be recommended. That recommendation, and subsequent experience, determined his career. When the University was looking for a suitable successor to Professor Heller, Morris possessed the necessary qualifications. He completed Heller's Stresses in Structures for publication, and subsequently published another textbook, Steel Structures. In 1943, in collaboration with Samuel T. Carpenter, a former student who had become Chairman of the Department of Civil Engineering at Swarthmore, Morris published Structural Frameworks.

Tall and slender, with a scholarly stoop and dignified mein, Professor Morris was the very figure of a distinguished professor. He continued to maintain

his professional practice, designing among other projects, the bridge across the Olentangy River for the railroad spur which the University built to the Hocking Valley Railway. On leave from teaching 1911-12, he developed the Bureau of Bridges of the Ohio Department of Highways. During 1920-22, Morris was on leave as chief engineer of design and construction of the Ohio Stadium. While he was on leave as engineer of the Stadium, his classes were taken by Joseph R. Burkey, C.E. 1908, who became Chief of the Bureau of Bridges of the Ohio Department of Highways.

Professor Morris was only a little more than seven years the junior of Professor Sherman, and his tenure as Chairman of the Department of Civil Engineering was only nine years. In 1947, soon after he reached the age of 70, Morris became Professor Emeritus. For several years more he continued a consulting practice which he was finally forced to discontinue on account of failing eyesight. He died in the summer of 1965 at the age of 88.

Professionally, Professor Morris was extremely active. He served as president of the Columbus Engineers' Club and of the Ohio Sociaty of Professional Engineers. He became a director of the American Concrete Institute and was high in the councils of the American Institute of Steel Construction. A member of the American Society of Civil Engineers since 1909, he was a director 1929-31 and became a life member in 1942. At the University he was a member of Tau Beta Pi and the Sigma Xi Society. In 1952 The Ohio State University bestowed upon him the honorary degree Doctor of Science.

There were some changes made in courses in the years following the accession

of Clyde T. Morris to the chairmanship. C. E. 612, Earth Engineering, was approved by the College Faculty as a new course in the spring of 1938; it was three credit hours, spring quarter, taught by Professor Large.

In the fall of 1938, the Graduate Council approved C.E. 709, Geodetic Engineering, to be taught by Professors Coddington and Marshall, and C.E. 734, Advanced Bridges, to be taught by Professor Morris.

In the spring of 1939 a new course, C.E. 799, Advanced Civil Engineering, three to five credit hours, to be given in Autumn, Winter, and Spring Quarters was approved. It was elective for graduate students and students in Civil Engineering or Architecture whose point-hour average was 2.5 or better. Prerequisite was full senior or graduate standing, plus such other prerequisites as the head of the department might require. It might be given by any of the instructors. There was this description:

> This course is intended to give the advanced student opportunity to pursue advanced study. The work undertaken may be elected in the field of highways, structures, sanitary engineering, water supply, geodetic engineering, transportation, and other special fields. It may be repeated until a maximum of 20 hours...not more than 10 in any of the above subjects. It will be a blanket course to cover a variety of civil engineering subjects. One of the principal reasons for asking that this course be included in the curriculum is the need of a course for graduate students and superior seniors who want to specialize in some line....

C.E. 730. a favorite course of Professor Sherman, under the title Transportation Engineering, had its description changed in the spring of 1940. The phraseology had been, "Engineering Economics, illustrated by rail, road, and water transportation;" the new description was "Engineering Economics illustrated by rail, highway, water and air transportation." The instructor was Associate

Professor John M. Montz, a graduate of Brown University, who, after a decade of railroad engineering experience, had come to the department as instructor in the fall of 1922. Montz taught many courses and participated in many summer camps before his retirement as associate professor emeritus in 1954.

Blitzkrieg in Europe began to have a profound effect on education in 1940. Classes were organized in the Engineering Science Management Defense Training program, quickly changed to Engineering Science Management War Training (from ESMDT to ESMWT) after Pearl Harbor. At the 1941 Ohio State Fair the departments of Civil Engineering and Architecture had a joint exhibit of a "bomb-proof" industrial building. After the United States entered the war, Professor J. Ralph Shank of Civil Engineering reported to the Engineering College faculty on a conference on protection against aerial bombardment. Chairman Morris was chairman of the Engineering College faculty committee on deferment of students in the draft; his recommendation was that requests for deferment should rest upon the student's progress in his studies.

Welding Engineering was now established in the curriculum. Professor Shank was placed in charge of a new course, C.E. 717, Framed Structures, to be included in the curriculum for welding engineers.

In his report for the year 1928, Professor Sherman had exulted in the record enrollment in Civil Engineering; there were 198 students, and that figure did not include freshmen who had expressed a preference for civil. Enrollment of students in Civil Engineering in the fall quarter 1937 totaled 169, including 29 freshmen who had selected C.E. There as attrition, as always, during the

year, with enrollment figures smaller in the winter and spring quarters than in the autumn quarter. The number of civils in the fall quarter of 1939 was 155, including 33 freshmen. In the fall of 1940 it dropped to 115, including 22 freshmen, and was almost the same in the fall of 1941--total 119, of whom 27 had chosen civil. There was a rush to enter college after the United States was at war, and total enrollment in the College of Engineering in the fall of 1942 was 2,094, the largest number ever in the history of the College. That fall of 1942, however, enrollment in Civil Engineering was only 127, including 55 freshmen.

Under pressure of war and the draft, that record enrollment of the fall of 1942 quickly melted away. Winter Quarter 1943 enrollment in Civil Engineering totaled 102, including 35 freshmen. Enrollment in the Spring Quarter 1943 was down to 58 civils, including 10 freshmen. The University had decided to go on a four-quarter basis, beginning with the summer quarter 1942 as the time for "regular" entrance of freshmen. However, in the summer quarter 1943 there were only 27 civils, including 4 freshmen. In the fall quarter 1943, when enrollment in the College had dropped to 688 (not counting the evening or "twilight" classes) enrollment in civil was only 27, including five freshmen. The nadir in enrollment in civil was reached in the Spring Quarter 1944, when the total was only 15, including 6 freshmen.

As hostilities drew to a close, there was a slight pick-up in enrollment. Civil Engineering enrollment for the Summer Quarter 1944 was 27, of whom seven were freshmen. In the Fall Quarter 1944, when the total number enrolled in the College of Engineering was 521, plus 11 in the Twilight School, there were 33

civils, including 20 freshmen. The number of civils had dwindled by the Winter Quarter 1945 to 26 (10 freshmen), and by the Spring Quarter to 21, of whom 9 were freshmen. By the summer of 1945, the futility of trying to advance the academic year by one quarter every year was realized, and the low enrollment in civil, total 14, of whom ten were freshmen, really does not count; the total of "regular" students in the College of Engineering that summer quarter was only 242.

After V-J Day, enrollments began to pick up. The total number of "regular" students in the College of Engineering in the Fall Quarter 1945 was 936, and of them 58 were enrolled in civil engineering--including 32 freshmen. For the Winter Quarter 1946 there were 1,503 in all, with 82 civils, including 31 freshmen. The Spring Quarter 1946 enrollment included 125 civils, 50 of them freshmen.

Summer Quarter 1946 enrollment indicated the desire of returned veterans to return to college as soon as possible; there were 1620 students in the College of Engineering (821 of them freshmen) and the number of civils was 105, including 41 freshmen.

With the arrival of the Fall Quarter 1946 the flood of students was almost overwhelming. The total number of "regular" students in the College that fall was 4,257, and, in addition, there were 128 in the Twilight school and 11 special students. Enrollment in Civil Engineering jumped up also; the number in the fall of 1926 was 273 total, including 108 freshmen. Shrinkage brought the winter 1947 enrollment in civil down to 255 but only 58 of them were freshmen, leaving 197 in the civil engineering courses. In the Spring Quarter 1947 there were 200 taking

civil courses plus 61 freshmen, total 261.

Maintaining classes during the war period (when instructors as well as students had departed for the services and for war industries and government assignments) and being able to provide faculty and facilities for the flood of students posed many difficult problems of administration. Naturally, the faculty members who remained on duty were not content with simply teaching the small classes. They could not if they had wanted to; there were classes to teach in the Army Specialized Training Program (ASTP) that had descended on the University, as well as courses in the Twilight School that required teachers, and work in the ESMWT classes. Professor Morris, in his report for the year 1944-45 complained that civilian training in the department had been greatly curtailed, ~~but~~ and that the "Army class teaching" had interfered with much desirable research.

Not only was the end of the war period a time for readjustment to take care of the needs and demands of the flood of students--the normal number who would be coming to college and also the returning veterans--it was also a time for readjustment to a drastic change in the curriculum, the introduction of the five-year course in the different branches of engineering. There was little time for innovations or stock taking. The main thing was to get the job done.

It was considered only fair that students who had started their college work before being rudely interrupted for war service should be able to complete the courses they had counted upon when they matriculated. The policy of the College of Engineering was to encourage all those who could do so to take the five-year curriculum, with its broadening courses, but to permit all who had started the four-

year curriculum to complete that if such was their desire. Those who had accumulated a small amount of credit in the College might return to the four-year curriculum if they returned within two years after discharge from the service or within a reasonable time after leaving war industries. Similar concessions were made to those who transferred from other colleges who had made their commitment to engineering before entering war service. There was almost endless adjustment. The mixture of five-year students--all who entered cold beginning with the Autumn Quarter 1945--and those pursuing the four-year curricula continued for a number of years.

This process of readjustment was going on in the summer of 1947 when Professor Clyde T. Morris retired from teaching. His successor was Professor George Elwyn Large, who became Chairman of the Department of Civil Engineering in 1947 and continued in that position during the following six years.

During the three-quarters of a century from the beginning of instruction in Civil Engineering, with the opening of the Ohio Agricultural and Mechanical College in the fall of 1873 (the name became The Ohio State University in 1878) to the retirement of Professor Morris in 1947, the faculty of the department had been remarkably stable, in that there was an unbroken succession of Ohio State men in the chairmanship from the beginnings under Professor R. W. McFarland. Professor Brown who succeeded McFarland had been a student under McFarland. Professors Sherman and Morris who followed Brown had both been students under Brown--and, in addition, Morris was a student in the department after Sherman was teaching there. Many of the other faculty members had been students in the department.

Sherman, Eno, and Morris were the professors in the department for the dozen years following the publication of A Commemorative Bulletin in 1910. Eno had received his C. E. at the University of Illinois, but Sherman and Morris were both Ohio State men. While Morris was on leave as chief engineer of the Stadium, 1920-22, his classes were taken by J. R. Burkey, substitute professor, who had received his C.E. at Ohio State, Class of 1908.

Beginning in 1923 there were five professors of Civil Engineering: Sherman, Eno, and Morris had been joined by R. C. Sloane and J. R. Shank. In 1924 Professor Eno started full-time research on soils, and John C. Prior began his thirty-year service in the department as professor, the first two years as "substitute" professor. E. F. Coddington became professor of geodesy in the department in 1924, for the first two years only two-thirds time, the other third in the department of mechanics. Through 1930 seven professors were listed in the Department of Civil Engineering, but beginning in 1931 Professor Eno was dropped from the department roll, though he continued as professor in the Engineering Experiment Station until his retirement in 1935.

Throughout the depression thirties six professors were listed in the Department of Civil Engineering: Sherman, Morris, Sloane, Shank, Prior, and Coddington. Sherman became Professor Emeritus in 1939, and died the following spring.

For 1940-41 and 1941-42 five professors of Civil Engineering were listed, and one of them, Professor Coddington, was emeritus. In 1942 George E. Large was advanced to full professor, and the listing of professors increased to six. Again, in 1946-47 following the death of R. C. Sloane, the number was down to five--Morris, Chairman, Shank, Prior, Large and Coddington, emeritus.

Among other members of the teaching staff during those 37 years following the publication of A Commemorative Bulletin in 1910, there was considerable turnover and some variety. A large number of them, however, were Ohio State men.

Under Professor Large the areas of Soil Mechanics and of Highway Engineering received increasing attention. Not only did the number of courses relating to these subjects increase gradually, but the volume of associated research expanded.

Highway Engineering which later became Transportation Engineering, developed largely through the efforts of Professor E. H. Karrer who came to the Department in 1946 following many years of experience with the U. S. Bureau of Public Roads. Professor Robert F. Baker, who resigned in 1962 to become Director of Research and Development for U. S. Bureau of Public Roads, joined the Department in 1952 as Director of Civil Engineering Research, with emphasis on highways and soils.

Professor Large resigned as chairman in 1953 in order to devote his time to teaching and writing. His service on various committees of The American Concrete Institute, together with the publication of his Reinforced Concrete Design in 1950, gave him a national reputation in his field. He continued to teach until his retirement in 1966 and he has continued with his writing and consulting work up to the present time.

In 1953 nine persons held professorial rank in the Civil Engineering Department although some engaged but part-time in teaching activity. From that time on the

size of the department gradually increased in response to the availability of research support and the increasingly analytical and complex nature of engineering practice which in turn influenced the number and types of courses both undergraduate and graduate curricula. In 1967 the number holding professorial rank exceeded two dozen. Conditions leading to this increase are described in the following paragraphs.

Professor Kenneth W. Cosens served as acting chairman until 1955 when Hamilton Gray was appointed Chairman of the Department. At about that time a great increase in academic research and development occurred throughout the United States. This new emphasis was created in part by the availability of funds from the federal government and resulted in a great increase in university research and in numbers of graduate students. In the Department of Civil Engineering the number of graduate students increased nearly tenfold within a few years. At the same time, as part of the "Six Year Plan for Engineering", the university provided new quarters for the department in the Civil-Aeronautical Engineering Building. Prior to that time the various civil engineering laboratories had been widely scattered and in most cases inadequate, but the new structure furnished greatly expanded and improved laboratory space for work in the fields of materials, structures, and soils. Simultaneously with the increase in research, various specialty areas emerged as follows:

1. Transportation Engineering Center, first under the direction of Professor Robert F. Baker and later under Professor Johannes F. Schwar.

2. Water Resources Center under Professor George P. Hanna, later under Professor Donald R. Washington. A separate small

building was rehabilitated for the activities in this area.

3. Building research laboratory under Professor Richard W. Bletzacker. Much space became available at the Research Center on Kinnear Road for large-scale testing of structural elements and for fire-testing of building components.

Not only was research work sponsored by governmental agencies and private industry carried out in these centers, but many graduate students found employment therein on research activities. The financial support for graduate students provided encouragement to pursue advanced studies, and explains the great increase in their numbers between 1955 and 1965. In addition, classwork relating to most areas of interest expanded substantially. Much more space became available for laboratories and offices in the new Hitchcock Hall in 1967. This space was timely in that it coincided with increased efforts and interest in the fields of traffic analysis and control and in studies relating to pavements and engineering materials.

In the 1960's, strong graduate programs flourished in the areas of structures, transportation, water resources, soil mechanics and foundation engineering, attracting students not only from the United States but also from many foreign countries. At the undergraduate level various revisions were made in the curriculum, providing greater emphasis on transportation, materials, and soils with less time devoted to surveying and to structures. Some of the courses which have been introduced in recent years bear the following titles:

Construction Management
Viscoelasticity
Concrete Shell Analysis & Design
Soil Dynamics
Photo-Interpretation
Rock Mechanics
Environmental Engineering

most of which would sound unfamiliar to the student of 15 years ago.

At the same time a professional type of program was made available for students from foreign countries who (sponsored by the International Road Federation) came to the university each year to learn about American methods of highway construction. This group averaged about fifteen individuals from which in the last fifteen years have emerged numerous directors of public works and chief engineers in Latin American and Asian countries.

Professor Karrer worked very closely with the IRF, often making summer trips to foreign countries to "follow up" the success of the teaching program, and devoted much time to the acclimatization of students from "backward" lands who arrive bewildered by the size and strangeness of America and the Ohio State University.

Special courses, as part of a "continuing education" program, attracted practitioners in the fields of construction management, water management, protective shelters, building inspection, etc. Professors Karrer and Bletzacker shared the bulk of the efforts to provide these continuing education courses and succeeded in bringing large numbers of practicing engineers, contractors and architects into contact with recent developments in engineering techniques.

About 1960 the Ohio Department of Highways undertook to support transportation research at the University in cooperation with the U. S. Bureau of Public Roads. This support has amounted on average to $\$800,000.$ per year. This effort has reached a level such that the State of Ohio is in the process of building a multi-million dollar transportation research facility on a 8200 acre tract near

Bellefontaine. This facility, conceived by Dr. Schwar, has received enthusiastic endorsement of state officials and promises to become the outstanding such center in this country. The association of department members with the activities of such would prove stimulating to classroom instruction and to student advising.

The rapid proliferation of scientific knowledge and production techniques which has occurred during and since the end of World War II has left its mark on Civil Engineering as well as on most other technical fields. The change from a relatively small faculty of "generalists" with close ties to practice, to a much larger faculty of "specialists" whose association with research is more prized academically than competence in practice, is typical of most Civil Engineering departments in large universities. The same is true of the increased emphasis on graduate programs. Few of the present faculty are graduates of Ohio State University, and emphasis in courses is upon basic principles and analysis, rather than upon the specifics of practice. The pendulum has thus swung well away from the position described by Professor Sherman in 1910, and only the future will disclose whether it will move still farther, or return part way toward its earlier position.

One of the criteria mentioned by Professor Sherman in his 1938 report was the "success of the graduates". "Success" can be construed broadly so as to reflect "education" rather than the narrower "training". The Department of Civil Engineering can point to a large number of highly successful alumni, of whom a brief sampling follows:

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| 1. | Karl Borntrager | Vice-President, New York Central Railroad |
| 2. | Ben C. Gerwick | Prominent West Coast contractor |
| 3. | John W. Graham | President, Clarkson University |
| 4. | Curtis LeMay | General, United States Air Force |
| 5. | George H. Wiehl | President, Albert Kohn, Detroit |
| 6. | Daniel Smucker | Vice-President, Penn-Central Transportation System |
| 7. | Elmer K. Timby | Partner, Howard Needles, Tawwen, Bergandorf |
| 8. | Kenneth B. Woods | Head, School of Civil Engineering, Purdue |